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Report on the United Nations/International Astronautical Federation Workshop on Making Space Applications Operational: Opportunities and Challenges for Sustainable Development

(Albi, France, 27-29 September 2001)*

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* The present report required preparation by the individual speakers of abstracts of the presentations that they had made during the workshop. This process took several weeks, which delayed the submission of the report.

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I. Introduction

A. Background and objectives

1. The Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space (UNISPACE III), and the Vienna Declaration on Space and Human Development that emanated from it, recommended that activities of the United Nations Programme on Space Applications promote collaborative participation among Member States at both the regional and international levels, emphasizing the development of knowledge and skills in developing countries.[1] At its forty-third session, in 2000, the Committee on the Peaceful Uses of Outer Space endorsed the programme of workshops, training courses, symposia and conferences planned for 2001 under the United Nations Programme on Space Applications.[2] Subsequently, the General Assembly, in its resolution 55/122 of 8 December 2000, endorsed the activities of the Programme for 2001.

2. The present report contains a summary of the presentations and discussions of the United Nations/International Astronautical Federation Workshop on Making Space Applications Operational: Opportunities and Challenges for Sustainable Development. Organized by the Office for Outer Space Affairs as part of the 2001 activities of the United Nations Programme on Space Applications, the workshop was co-sponsored by the International Astronautical Federation (IAF), the European Space Agency (ESA) and the Government of France. It was the eleventh workshop of this series and was held in Albi, France, in conjunction with the fifty-second Congress of the IAF, held in Toulouse. Organizational, financial and programme support was provided locally by the Centre national d'études spatiales (CNES) of France.

3. Noting that the Committee had agreed that one of the single issues/items for discussion on the draft provisional agenda for the thirty-ninth session of the Scientific and Technical Subcommittee would be the mobilization of financial resources to develop capacity in space science and technology applications,[3] the co-sponsors agreed to focus the presentations and discussions of the workshop on that topic. Thus, the report of the workshop could provide background material on funding issues for consideration by the Subcommittee.

4. Applications of space technology play an increasing role in national development. However, the potential of space applications, particularly for developing countries, in such fields as remote sensing, telecommunications and satellite navigation and positioning systems, while enormous, remains largely unrealized. The ability to use space applications for development depends critically on the availability of personnel with appropriate knowledge and skills; on the possibility for them to gain experience; on establishing long-term policies; on setting up institutional frameworks and physical infrastructures; and on ensuring support for the operational use of the technology.

5. As is the case for any project, appropriate funding is crucial for the success of development initiatives using space technology. The lack of funding from both national and international sources is often the major obstacle in introducing space technology into operational development programmes or projects. That obstacle is linked to a low level of awareness of the possibilities and requirements for ensuring adequate financial resources to support priority programmes and to an inability to prove the cost-benefit advantage of space technology applications to decision makers and users.

6. The main objectives of the workshop were to assist participants in identifying: (a) the elements that would make project proposals acceptable to decision makers such that their results could serve as a basis for establishing operational Earth observation or other space applications; and (b) the conditions that would lead to the formulation of project proposals that were attractive to funding institutions or donor agencies.

7. The present report covers the background and objectives of the workshop as well as the presentations, discussions, observations and conclusions of the participants. It has been prepared for submission to the Committee on the Peaceful Uses of Outer Space at its forty-fifth session and to its Scientific and Technical Subcommittee at its thirty-ninth session in 2002. The participants will report to the appropriate authorities in their own countries. The proceedings of the workshop, together with a list of participants, will be made available in due course through the Office for Outer Space Affairs.

B. Programme

8. The workshop addressed the questions of how space applications could be made operational in programmes or

projects that were essential for sustainable development and of securing the necessary financing. That was achieved by considering different aspects of three successful case studies from different regions: Asia and the Pacific; Latin America and the Caribbean; and Africa. One of the case studies was a single project (project I) while the other two case studies (projects II and III) provided examples of frameworks for carrying out multiple projects. Although concentrating on the elements necessary to prepare a successful project/programme proposal, the presentations included the obstacles that had been encountered in obtaining funding for projects and how those obstacles had been overcome.

9. The participants were shown examples of how to formulate attractive project proposals that described the needs to be addressed and the solutions to be provided in a clear and comprehensive manner, specifically demonstrating the integration and cost-benefit advantage of Earth observation applications in such project proposals.

10. A separate session addressed funding and financing strategies. Representatives of national and international funding organizations were invited to explain the application procedures and project requirements of their respective organizations, and the presentations were complemented by panel discussions. Thus, participants were given the opportunity to identify positive elements to include, as well as pitfalls that should be avoided, when drafting submissions to national and international institutions and donor organizations.

11. In addition, 14 participants, mainly from developing countries, made short presentations and provided an insight into the status of space technology applications in their respective countries.

12. Presentations were made by the Indian Space Research Organization (ISRO), the University of São Paolo (Brazil), the Canadian International Development Agency (CIDA), the African Development Bank (ADB), the United National Office for Outer Space Affairs, the Association pour le Développement de l'Information Environnementale (ADIE), the École Nationale du Génie Rural des Eaux et des Forêts (Engref, France), the Inter-American Development Bank (IADB), the Instituto Nacional de Pesquisas Espaciais (INPE) of Brazil, the Dirección General de Aviación Civil of Chile, the Instituto de Geofísica y Astronomía of Cuba, the Universidad do Norte do Paraná of Brazil, ESA, Tübitak of Turkey, the University of Rajasthan (India), the National Institute of Aeronautics and Space (LAPAN) of Indonesia, the Université Mohammed V. (Morocco), the Bangladesh Space Research and Remote Sensing Organization (SPARSSO), Surrey Satellite Technology Ltd. (United Kingdom of Great Britain and Northern Ireland), the United Nations Educational, Scientific and Cultural Organization (UNESCO), the Uzbekistan State Space Agency, the South African Astronomical Observatory and the Centre National des Techniques Spatiales of Algeria.

C. Attendance

13. The United Nations, on behalf of the co-sponsors, invited developing countries to nominate candidates for participation in the workshop. Selected participants were required to have a university degree or well-established professional working experience in a field related to the overall theme of the workshop. In addition, participants were selected on the basis of their working experience in programmes, projects or enterprises that were already using space technology applications or that could potentially benefit from using space technology.

14. Funds contributed by the Government of France, the United Nations, ESA and IAF for the organization of the workshop were used to cover the international air travel and per diem expenses of 21 speakers and participants from developing countries. The co-sponsors also covered the cost of registration fees and living expenses for participants from developing countries to participate in the 52nd International Astronautical Congress, which was held immediately after the UN/IAF workshop.

15. The workshop was attended by 62 participants from the following 30 countries: Algeria, Angola, Austria, Bangladesh, Brazil, Canada, Chile, Cuba, France, Gabon, Germany, India, Indonesia, Israel, Italy, Japan, Jordan, Morocco, the Netherlands, Romania, South Africa, Spain, the Syrian Arab Republic, Tunisia, Turkey, Ukraine, the United Kingdom, the United States of America, Uzbekistan and Yugoslavia.

II. Observations and conclusions

16. The participants examined which needs should be met by project proposals, who should act as partners in the implementing team, what synergies should be sought and how to overcome obstacles in projects.

17. The participants found that the main obstacles to making greater operational use of space applications in sustainable development projects or programmes could be classified under the following three broad categories:

(a) Lack of or insufficient awareness on the part of decision makers and programme managers of the usefulness of space technologies to support development projects or programmes;

(b) Lack of or insufficient funding dedicated to the use of space technologies in a project or programme, which translated into insufficient hardware, software, literature and satellite data;

(c) Lack of or insufficient local capacity to use space-related technologies.

18. Through discussions held during the question-and-answer periods after each of the presentations and during the panel and round table, the participants made the observations and drew the conclusions that follow. Although the observations and conclusions focused on remote sensing applications, analogies could be drawn for other space applications.

Raising the awareness of decision makers

19. The main priorities of the governmental and non-governmental institutions of a country are to provide solutions to basic needs (e.g. food, clean water, shelter, disaster reduction, health and education services, energy and communications) of its population and in general to promote a better quality of life for all. At the international level, Governments try to meet obligations, such as those in respect of climate change as set out in the Kyoto Protocol.

20. Attempts leading to the use of Earth observation data on an operational basis should be put into the context of meeting national needs. That is, remote sensing and other space technologies should be integrated into management and policy-making as a tool to support development priorities.

21. The process of convincing decision makers of the usefulness of remote sensing from space is lengthy and requires continuous dialogue. Drawing from the lessons learned by individuals and institutions that implemented the projects that were presented to the workshop, the participants concluded that it takes four to five years to convince decision makers and other stakeholders of the usefulness of remote sensing.

22. Those who can provide the application capabilities can begin by proposing to decision makers in potential user institutions that remote sensing could be used to provide solutions for clearly identified needs. In doing so, it is essential to understand the needs for information that those decision makers have and the form in which that information should be presented for it to be useful in their work. Proposals should be participatory in nature, involving all the stakeholders.

23. A way of bringing together all the stakeholders is through a pilot or demonstration project. The results of such a project are more likely to be accepted if a "bottom-up" approach is followed, in some cases reaching down to the grass-roots level. The involvement of non-governmental organizations helps in interfacing with that level. Owing to the diverse backgrounds of those involved in the project, a training component will be necessary to develop a common understanding of the terminology to be used.

24. It would be important to identify within the user institutions individuals who could act as "champions" for projects. These would be individuals who strongly support the use of new technologies to achieve the development objectives of the project proposal.

25. The information provided by a project should be in a language to which the end users are accustomed. An important product would be a concise report that enables decision makers to compare the results achieved using remote sensing with those achieved using conventional tools in terms of costs, time and quality. It would also be important to highlight the "products" of the project, for example, long-lasting tools such as a digital database for future decision-making, as well as the capacity that has been built up.

Ensuring funding support on a sustainable basis

26. Once the use of a space application has been integrated into the broader context of national or regional development priorities, funding needs to be secured. There are various national and international sources and mechanisms for funding projects or programmes, and the choice of which of these should be approached would depend on the priority area to be addressed and whether the project is meant to be a demonstration or operational.

27. The three case studies that were presented at the workshop were examples of successful projects or sources of projects that addressed either local or national

needs and had received the necessary funding support. All three had been built upon the resources (in cash and in kind) of the institutions carrying them out. However, each of them used a different funding source or mechanism to supplement the balance of resources needed.

28. In addition to the budgets and resources of the partners of a project proposal, other funding sources include the ministries that would be the end users, national institutions funding research and development, bilateral development aid institutions, regional and international development institutions, dedicated international development funds (e.g. the Global Environmental Facility or the United Nations Foundation) and the private sector as well as funding mechanisms such as using a part of an ad hoc state tax or the revenue derived from the results of the project. In the case of the private sector, a company may be willing to provide some of the financing for a project if it is given the right to commercialize the methodology developed by the project.

29. Those preparing project or programme proposals to be submitted for funding should ensure that the proposals will be attractive to potential donor or funding institutions (hereafter referred to as "funding institutions"). Making a proposal attractive requires extensive background work. Some guidelines to consider are presented below.

30. Projects or programmes that address national priorities generally have budgets for carrying out the work involved in meeting their objectives. In cases where those budgets are insufficient, it is expected that whatever international or private sector funding might be secured would be targeted primarily for those priority areas. Thus, a premise upon which project proposals should be built is that the use of space technology can improve the cost-benefit ratio that can be expected for the limited financial resources available.

31. The proposal should be made by a balanced team that includes members with all the skills required. Demonstration projects and, in particular, operational projects or programmes need to have strong support from each participating institution. At least one of the institutions should have well-established capabilities in the specific space application, for instance remote sensing. Where this is not the case, technical advice should be sought through international cooperation. The whole team should be exposed to the technology underpinning the project. Interdisciplinary rivalries among participating institutions should be resolved, and the roles of each partner should be clear.

32. Government support is a must for projects or programmes of national scope and for projects for which international funding will be sought. There should be a firm funding commitment (in cash and in kind) to a pilot or demonstration project proposal by the institutions that participate in it, as this will add credibility to the proposal. The user institutions should clearly indicate their commitment to using the space application upon demonstration of its cost effectiveness.

33. It is necessary to know the funding institutions and their procedures. The proposal should target donor priorities. Key individuals in the funding institutions should be identified. It is very useful to find a "champion" in the funding institution to support the project through the various stages of the funding procedure.

34. The proposal should include an indication of the conditions for and methods of sustaining the space application on an operational basis after the demonstration phase. Funding institutions consider it important to be assured that the results of financed projects will continue to be used once the external funding ceases.

35. Overall, a proposal submitted for funding should be based on complete documentation. The submitting entity should be prepared to answer all questions and concerns of the potential funding institution.

Building local capacity to use space-related technologies

36. There is a pressing need to provide developing countries with further education and training opportunities in all areas of space science and technology. Education and training is essential if space technologies are to be integrated into operational programmes. In particular, there is a need to build capacity for greater operational use of Earth observation data. The demand is for information derived from space data rather than for raw remote sensing data. Thus, there is a need for training to develop capacity in "integrated approaches", i.e. using other technologies such as geographic information systems (GIS) and global navigation satellites.

37. As the subject on education and training had been dealt with in many other forums, the participants did not elaborate on this subject during their discussions.

III. Summary of presentations

38. The workshop was opened with welcome statements by representatives of CNES, the City of Albi, IAF, ESA and the United Nations Office for Outer Space Affairs.

39. In his address entitled "Space and Sustainable Development", U. R. Rao, Chairman of the IAF Committee for Liaison with International Organizations and Developing Nations (CLIODN) used several examples to highlight the value of using space technology to support sustainable development and introduced the objectives of the workshop. In the ensuing discussion, it became clear that the use of space applications should be integrated into the broader context of national or regional development priorities and that emphasis should be placed on understanding the needs and possible contributions of the end users.

A. Conservation of water resources and forest cover (project I)

40. Carlos A. Vettorazzi presented a case study on a project carried out in Brazil for the conservation of water resources and forest cover in the Corumbatai river basin (an area of 1,760 km^2) to ensure the supply of drinking water for the City of Piracicaba (350,000 inhabitants) in the State of São Paulo. The project also aimed at addressing the high level of pollution of the Piracicaba River, which was due mainly to agriculture and cattle raising activities carried out in areas originally covered by dense native forests. Thus, one of the main objectives of the project was to map priority areas for reforestation with appropriate plant species. The use of satellite images, global navigation positioning from satellites and GIS became some of the tools selected to reach that objective.

41. The project was an excellent example of a national institution with space-applications capabilities, namely the Forest Research Institute of the University of São Paulo, working with all relevant local user authorities, i.e. the Water Department of Piracicaba, the Municipal Office of Environment and Planning of Piracicaba, an inter-municipal consortium for the Piracicaba, Jundai and Capivari river basin authorities, and the Forest Institute of the State of São Paulo.

42. Each participating entity provided the financial and infrastructural support needed to carry out most of its share in the project. Additional funding for the project was obtained from part of a tax of 0.01 reais that was collected by the inter-municipal consortium of river basin authorities for each cubic metre of drinking water that was delivered by the project. The other part of the tax was dedicated to clean-up operations.

43. The project required around four years to bring all relevant actors together and to resolve conflicts of interests, particularly between agricultural and cattle-raising activities and the need for an abundant and clean water supply for the City of Piracicaba and its environs. Those conflicts were resolved primarily on the basis of an existing law for the regeneration of the environment.

44. The project also had to overcome difficulties in communication between the various partners (e.g. agronomers, foresters, civil engineers, hydrologists and administrators). Another obstacle was the non-existence of a regional database and other basic infrastructure.

45. As a result of the project, a digital database of the Piracicaba river basin was currently available to decision makers and scientists, the reforestation of the basin was under way and an education process for planners, other users and the general public had begun. New infra-structure had emerged as a concrete result of the project as well as increased user awareness of the solutions that space technology had to offer. The successful results obtained by the project had led to invitations to apply the same methodology in other river basins.

B. Remote sensing applications for sustainable development: lessons learned from the Indian experience (project II)

46. Mukundo Rao, ISRO, presented the Remote Sensing in Support of National Development Programme of India and the lessons learned during its implementation. India is one of a handful of spacefaring nations that had end-to-end capabilities in space science and technology. Those capabilities covered the development of launchers, building of satellites and having programmes in all fields of space technology applications, including natural resources sustainability, environmental integrity and disaster support programmes.

47. Over many years, India's policy on the development of space technology had been that its applications had to meet national needs. Following that policy, India had established the National Natural Remote Monitoring System (NNRMS) as part of its space technology applications programme. NNRMS is based on the following cornerstones:

(a) Remote sensing satellite missions are defined and implemented on the basis of national needs;

(b) Based on a staged approach, appropriate application programmes are developed;

(c) The technology applications programme begin with demonstration projects that are followed by national projects and finally the technology is integrated into national/state programmes;

(d) A user network, integrating the end-user organizations in all of the programme's phases is created;

(e) Training and research activities are an integral part of each programme;

(f) Implementation of the programme is done by local agencies (i.e. delivery to grass-roots level);

(g) Application projects are directly funded by the appropriate ministries;

(h) The commercial sector is integrated.

48. Throughout the country, 23 remote sensing centres generate information that is provided to state and district agencies for use in project implementation. Some of the operational application programmes that had been developed in the framework of NNRMS were in the following areas:

(a) *Agrometeorology and land-based observations*. From a prototype project, the application evolved into a national programme with the establishment of an operational national centre for crop forecasting. The centre generates four crop estimates prior to harvesting;

(b) *Management of drinking water resources*. The programme provides information for the provision of drinking water to 600,000 villages. The programme started as a demonstration project on the methodology for using remote sensing data for water management purposes and evolved into a national project for finding sources of water. It was subsequently turned into a national/statewide water management programme;

(c) *Integrated Mission for Sustainable Development (IMSD)*. IMSD evolved from a demonstration project on the methodology for using remote sensing data to support sustainable development, involving 12 districts in 1992-1993, into a national project, involving 171 districts in 1994-1998) and, since 1999, into a national/statewide programme for sustainable development. IMSD integrates ground, remote sensing and ancillary data. The information derived is used to support specific local action plans, e.g. surface-water exploitation, groundwater exploration and recharge, soil conservation, and alternative land use;

(d) *Other areas*. Other operational applications include the mapping of salt-affected soils and water-logged areas, wasteland mapping and developing strategies for urban development (applied in almost every major city in the country);

(e) *Disaster management*. Currently, work is ongoing at ISRO and NNRMS in the application area of disaster management. The work to date involves pilot projects in pre-disaster and post-disaster activities. Work is also going on in determining Chlorophyll-a distribution in the ocean for fishing purposes.

49. For the future, the following NNRMS applications are being considered:

(a) Conducting a natural resources inventory at a national scale;

(b) Producing small-scale cartographic maps of the country;

(c) Maximizing the dissemination of information on natural resources;

(d) Improving ocean state and weather forecasting;

(e) Improving support of the disaster management system;

(f) Developing a better scientific understanding of the Earth system and its processes;

(g) Establishing an information service for public use based on Earth observation applications;

(h) Assisting in the creation of a viable commercial remote sensing industry.

50. It was stressed that the Indian example was not the only way to plan for using space-gathered information. India was autonomous in space activities, which was not

the case for many other countries that could benefit from space technology applications. It was also mentioned that it was necessary to customize solutions to the needs of specific countries and users. For example, while some countries could benefit from launching a national small remote sensing satellite, other countries might find it more cost-efficient to purchase the data.

C. Association pour le Développement de l'Information Environnementale (project III)

51. Jean-Roger Mamiah, ADIE, made a presentation entitled "ADIE: Presentation and its Realizations in the Earth Observation Domain". ADIE had been created by a ministerial convention and was a body for regional coordination of national researchers, non-governmental organizations and the public sector. ADIE made available technical assistance to national institutions through national experts and international partners.

52. The main purpose of ADIE was to make information available to decision makers and had organized many workshops to train people locally on mapping technologies. To that end, it entered into contracts with organizations to provide them with satellite imagery and training. ADIE focused on the implementation of projects by getting the potential users involved in the project. All project funding was in the form of grants. ADIE worked through international cooperation and welcomed the prospect of enhancing it.

53. In many countries of central Africa, there was an insufficient number of local experts, limited baseline environmental information and underutilization of existing environmental information for decision-making. Those factors were significant obstacles for the use of information derived from space images. That meant that an extensive effort needed to be made to provide education and training, at all levels, in order for Earth observation data to be used operationally in sustainable development projects or programmes.

54. Gilles Lechapt, of École Nationale du Génie Rural des Eaux et des Forêts in Engref, France, made a presentation entitled "ADIE: Giving Priority to Users". As implied in its name, ADIE promoted development through international cooperation in the use of information for decision-making, particularly related to environmental matters.

55. Under the ADIE concept, "operational" meant that a project could be carried out with available and affordable resources. Thus, to the extent possible, ADIE used local skills to lower costs. At the same time, ADIE aimed to initiate service activities and to demonstrate their usefulness and their cost effectiveness.

56. ADIE supported project initiatives based on the identification of pressing user needs and placed great importance on the sustainability of its projects. In support of that policy, ADIE initiated service activities in the field of analysis of needs. Donors did not pay for data, but rather paid for the funding of local initiatives.

57. The experience of ADIE showed that to build a self-supporting institution it was necessary to obtain political support and recruit local experts, limiting the use of international experts. At the same time, it was important that there be local commitment to pay for infrastructure and that the cost was not passed on to the donors. Sustainability of projects also required that a well-trained community be built up. That included local training at a high level of expertise and north-south as well as south-south partnerships.

58. In the ensuing discussion, it was stressed that it was important to ensure the projects were sustainable and would not collapse once the initial seed funding had dried up. It was also mentioned that once the usefulness of remote sensing data was recognized, the user was usually willing to pay for it.

D. Funding and financing strategies

59. Presentations by representatives of CIDA, ADB, IADB and the Office for Outer Space Affairs described funding and financing strategies for development projects that integrated space technology applications.

60. First and foremost, the great majority of funding institutions funded development projects, not space projects. That meant that even a significant space component to a project had to be presented in the overall context as tool to the success of a sustainable development project. There were, however, institutions that funded scientific and technological research and development.

61. The representatives of funding institutions placed particular emphasis on the need for proponents of the use of space technology in development projects to

understand the mandates of funding institutions and the specific criteria established for specific funding programmes. Often, projects were not even considered for funding because they did not meet the formal criteria required of proposals. When the formal criteria were met, proposals were always evaluated against rating criteria, and a proposal was awarded points on the basis of how well its elements met each of the criteria. It was therefore essential for the initiators of a project to find out what those rating criteria for projects were.

62. In addition to developing a good understanding of the priorities of funding institutions, it would be important to identify within the institutions individuals who could act as "champions" for projects. Nevertheless, successful proposals had to demonstrate that the cost of offering a space-based solution was warranted by the greater benefit in development terms derived from it.

63. CIDA was the Canadian government organization charged with planning and executing approximately 80 per cent of the country's international development programme. With a budget of around $2.4 billion Canadian dollars, CIDA funded projects that supported sustainable development in more than 100 developing countries. A special extra fund of Can$ 100 million, to be spent within a five-year period, had been established to address climate change issues.

64. CIDA project activities took place within the context of established development policies, a management framework and a programme planning process. Those elements formed the broad environment in which projects were identified, appraised, designed, implemented and evaluated. The overall framework for Canadian development assistance concentrated on: (a) meeting basic human needs; (b) promoting the participation of women in development and gender equity; (c) infrastructure services; (d) human rights, democracy and good governance; (e) development of the private sector; and (f) the environment. Additional information on CIDA priorities and funding procedures may be obtained on its web site: www.acdi-cida.gc.ca.

65. The presentation by CIDA included the following basic principles to improve chances of getting funding for a proposal: (a) determine whether there is a market within CIDA for the proposal; (b) obtain an up-to-date copy of the instructions and other relevant information; (c) complete all parts of an application and submit it on time; (d) ensure that the proposal meets every evaluation criterion; (e) cultivate key contacts in CIDA and keep in touch regularly; and (f) be persistent.

66. ADB was a multilateral funding institution constituted by 77 member States (53 African countries and 24 donor countries). The main objective of the Bank was to assist its member States in reducing poverty by financing activities that supported, among others, good governance, agriculture, education and the development of the private sector.

67. Funding was provided to African member countries of the Bank on the basis of a classification (rich, intermediate and poor). Depending on that classification, member countries might be able to obtain loans from the Bank only, from the Nigeria Special Fund (medium rates) or from the Bank and the African Development Fund (soft loans). There were also funds that were disbursed as grants to finance technical assistance projects that were supervised by Bank specialists.

68. IADB sought to contribute to the efforts of its member States to attain a sustainable use of their environment and natural resources endowment by providing the technical and financial instruments necessary to achieve such a goal. For that purpose, IADB offers several financing mechanisms.

69. IADB determined the eligibility for funding on the basis of the priority awarded to projects by the requesting Governments, the eligibility of the proposed executing institution(s), the technical feasibility of the projects and the logical framework of the proposals. A critical condition for the selection of submitted project proposals was a proven demand for the proposed project activities and expected results.

70. Regarding the use of information and communication technology (ICT) for development by its member States, the objectives of IADB were to: (a) provide strategic and technical advice to Governments for the establishment and use of ICT; (b) carry out strategic analyses of needs, priorities and opportunities; (c) develop cooperation and co-financing agreements; (d) provide technical backstopping to projects; (e) promote linkages with and disseminate information to the public, private and civil society sectors; and (f) provide training in ICT. Recently, the IADB had established a programme to fund information and communication technology for social purposes (the "Tech Fund"). One of the programme's objectives was to ensure that the deployment of advanced geospatial technologies was

integrated with information and communication technologies.

71. The Office for Outer Space Affairs had acquired a degree of experience in seeking funding for projects. Some of that experience showed that space technologists and institutions preparing proposals often did not know where to begin the search for funding. To overcome that obstacle, it was highly desirable to establish a comprehensive database of potential funding institutions and their areas of interest. Establishing such a database made it possible to seek funding from a wide variety of sources and/or to tailor a project to a specific and relevant funding niche.

E. Panel and round table discussion on funding and financing strategies

72. A panel discussion on the last day of the workshop arrived at the conclusions presented below. Panel participants were Robert Missotten, UNESCO; Jean Sabourin, CIDA; a representative of the Office of Outer Space Affairs; and Jean-Pierre Rigoulot, ADB. Danilo Piaggesi, IADB, contributed to the discussions through a videoconference from the Bank's headquarters.

73. User-driven, application-oriented pilot projects were a good way to demonstrate that space technology could be a useful, practical, operational and cost-effective alternative to the use of traditional tools in providing solutions to specific development problems. Cost-benefit assessments, such as in using space imagery compared to aerial imagery, were essential.

74. A "best-practice" handbook for development projects using space assets would be useful. Space technologists often did not have significant experience in seeking funding for development-oriented projects. The approaches and strategies for drafting successful proposals to development funding institutions were quite different from those used for research and development or science and technology funding agencies. A best-practice handbook could be a useful tool for helping project proponents start the search for funds.

75. The space community had to reach out to sensitize the funding community to the relevance of space technology for development applications. One new method for accomplishing that would be for the space community to organize seminars at the venue of the donor agencies.

76. Jean-Pierre Rigoulot, ADB, stressed that the Bank was, in principle, ready to support any project contributing to reducing poverty in a country. However, of the US$ 36 billion that were available, only US$ 20 billion had been disbursed because countries did not meet the requirements.

77. Often, a Government decided what was best for the population, which was a top-down approach. However, when the beneficiaries were not integrated into the project, the efforts sometimes collapsed when the donor withdrew at the end of the project. Therefore, for the project to be considered sustainable, many donors insisted on a participatory approach that included the beneficiaries.

78. Jean Sabourin, CIDA, mentioned that, in some cases, consultants involved in developing projects actually had little experience in working with developing countries. For CIDA, a participatory approach was therefore mandatory. CIDA used an iterative approach to its projects, which started with a small pilot project; only after successful completion of the initial project did the effort evolve into a fully-fledged project.

79. A representative of the Office for Outer Space Affairs indicated that the process of obtaining funding for development projects could also act as a reality check for the project. That meant that, if attracting development funding for a project was difficult, perhaps the application or the approach in presenting the application was not the best possible. It was necessary to develop the skills and tools to attract funding for projects. For that purpose, a database of successful project case studies as well as a database of funding and donor institutions would be very useful.

F. Presentations by participants

80. The workshop provided opportunities for participants to describe their national activities, including elements that had made those activities successful or were obstacles. The presentations are summarized below.

81. Amarendra K. Sinha of the University of Rajasthan (India) presented sustainable development projects that addressed the problem of water security. In India, many regions might experience water scarcity by 2025. It was therefore necessary to map existing water resources for better management of them. Such maps were being prepared with the help of remote sensing data,

particularly to identify rainwater harvesting sites for artificial recharge and to locate the critical areas where immediate watershed management action was required. Such information was provided to the local water management institutions.

82. Hector Gutiérrez of the Dirección General de Aviación Civil (Chile) reported on the establishment of a dedicated office to develop satellite applications programmes. Through that office, the air navigation system in Chile utilized information from the Global Positioning Satellite system (GPS), the COSPAS/SARSAT system, and meteorological satellites for aviation purposes. Other space activities in Chile included the FASat-BRAVO small satellite project. Mr. Gutiérrez stressed the importance of knowing when it was useful to use space technology for cost-benefit reasons.

83. Alberto Garcia Rivero of the Instituto de Geofísica y Astronomía (Cuba) made a presentation entitled "Application of Remote Sensing in Cuba: Examples in Geological Research". Cuba had started with an aerial panchromatic survey of the country in 1956-1958. The first activities involving space remote sensing had begun in 1975 in the Intercosmos framework and included the international experiments "Trópico I/II/III", "IR-87", "Caribe Intercosmos" and others. The main applications in Cuba were geological mapping and tectonic interpretation, the search for mineral deposits and the determination of geological hazards (landslides and collapses, areas that might be affected by earthquakes and floods). Currently, there was an increase in the use of GPS applications. Data and information were provided to the local government.

84. Mónica Miguel Lagos of the ESA Outreach Office made a presentation entitled "An Integrated Approach to Education on Earth Observation". The Office was integrating several efforts of ESA including: (a) "Teach and Track", to educate young people around the world on the potential benefits of space; (b) Kiteye, a project to use kites to support workshops with in-situ remote sensing for young people; and (c) the European Earth Observation Web Portal for Secondary Schools, to raise awareness on Earth observation applications among students. In its activities, ESA cooperated with the European Association for the International Space Year, which had also established outreach programmes focusing on Earth observation applications. Discussions were under way to establish cooperation with the Globe Programme of the National Aeronautics and Space Administration (United States).

85. Paul Stevens of Surrey Satellite Technology Ltd. (United Kingdom) introduced Surrey's Disaster Monitoring Constellation. Surrey aimed to establish a disaster-monitoring constellation of satellites. Currently the proposed constellation consisted of five micro-satellites (100 kg, orbit altitude of 690 km, 36-m resolution in three spectral bands, daily imaging). Each microsatellite would be funded and built by a different country; current candidates included Algeria, China, Nigeria, Thailand and the United Kingdom. Each member would be able to benefit from the entire constellation using an existing network of groundstations. Surrey and its partners planned to commercialize the operational system.

86. Olga Rasuleva of Uzbekcosmos (Uzbekistan) made a presentation entitled "Space Research and Technology Applications in Uzbekistan: Prospects of Sustainable Development". Space activities in Uzbekistan included the construction of an international radio-astronomical complex RT-70. The project was to be completed in 2005 and was seeking international partners. Uzbekcosmos organized joint ventures and activities. Funding for those activities came in part from State programmes and the rest from international partners. For instance, a conference on how to make space technology applications operational, held in 2001, was co-sponsored by the Government, the European Commission and the Gesellschaft für Angewandte Fernerkundung (GAF).

87. El Medhi Alem of the Université Mohammed V (Morocco) distributed a paper that dealt with the roles of Earth observation and education in sustainable development and presented some of Morocco's experience in dealing with the challenges of teaching remote sensing and incorporating remote sensing into scientific research objectives.

88. Fernando Stancato of the Universidad do Norte do Paraná (Brazil) reported on student rocket and small satellite projects as part of the efforts being carried out in Brazil to incorporate young students into space activities. The student group had launched a 3.5-metre rocket and would work on building a nano-satellite. The group had found an unusual source of funding from the private sector by promoting among the news media that it would broadcast the first Brazilian voice from space.

89. Tamer Özalp of Tübitak (Turkey) made a presentation entitled "Space as a Matter of Strategic Importance: National Development Policy and Plans of Turkey". Turkey's space-related activities in the public and private sector were growing, and space technology had been identified as a priority area. Space activities were coordinated by the Supreme Council for Science and Technology. A draft law had been prepared for the creation of a national space agency that would lead and coordinate space-related activities. A national space policy had been drawn up to support the agency. Turkey had started negotiations with ESA on the possibility of cooperating in some projects.

90. Erol Tunali of the Information Technologies and Electronics Research Institute (BILTEN) (Turkey) presented the BiltenSat Imaging Satellite project. BILTEN started the BiltenSat programme in August 2001. BiltenSat was a 100-kg class satellite with VHF/UHF and S-band telecommunications payloads and a 12-m resolution imager in the panchromatic region of the electromagnetic spectrum and a 26-m resolution multispectral imager. The goal of the project was to enable Turkey to design, manufacture and operate small satellites.

91. Euis Susilawati of LAPAN (Indonesia) gave a presentation entitled "The Eminent Obstacles Impeding the Maximum Possible Use of Space Technology in Indonesia". Obstacles cited for telecommunications activities were insufficient coordination between government entities and industry and the lack of a clear legal framework. For Earth observation activities, the obstacles were that there was a lack of information and awareness of the potential of remote sensing by the user community and that the private sector participated only in selling and not in adding value to the data. In space sciences, LAPAN was proposing to increase awareness at the decision-making level, increase coordination among space-related agencies, involve industry and the private sector in space activities and emphasize the cost-effectiveness of space technology.

92. Peter Martinez of the South African Astronomical Observatory (South Africa) gave a presentation entitled "Towards an Institute for Space Science in Southern Africa". The presentation reported on efforts being carried out to coordinate astronomical facilities in Southern Africa and included some of the obstacles being faced. In particular, there was a need to reduce the "brain-drain", to create synergistic activities and to promote the involvement of industry in the region.

93. Tahar Iftene of the Centre National des Techniques Spatiales (Algeria) made a presentation entitled "Desertification Sensitivity Map Realization using Remote Sensing: the Case of the Algerian Steppe", which was a pilot project aimed at establishing the local capacity to develop such maps over other areas.

94. Ahmed Sayeed of SPARRSO (Bangladesh) gave a presentation entitled "Remote Sensing and Space Applications in Bangladesh". As Bangladesh was subject to many disasters of meteorological origin, many of the applications at SPARRSO were oriented to monitoring weather patterns. Other Earth observation applications were in shrimp farming, crop monitoring, drought and water balance studies.

95. Robert Missotten of UNESCO reported on recent activities carried out to implement the Integrated Global Observing Strategy (IGOS). The work was being carried out in the framework of the IGOS Partnership, for which Committee on Earth Observation Satellites (CEOS) provided the space observation component. The aim of the Partnership was to develop an operational approach in Earth observation, integrating ground and space measurements and assuring the continuity and availability of data.

Notes

[1] See *Report of the Third United Nations Conference on the Exploration and Peaceful Uses of Outer Space, Vienna, 19-30 July 1999* (United Nations publication, Sales No. E.00.I.3), chap. I, resolution 1, para. 1 (e) (ii), and chap. II, para. 409 (d) (i).

[2] *Official Records of the General Assembly, Fifty-fifth Session, Supplement No. 20* and corrigendum (A/55/20 and Corr.1), para. 37.

[3] *Official Records of the General Assembly, Fifty-sixth Session, Supplement No. 20* (A/56/20), para. 133.